GOAL 7

Affordable and Clean Energy

27
Research Projects

50
Publications

50
Patents

Centre of Excellence in Energy

NUST collaborated with Arizona and Oregon State Universities to establish U.S.Pakistan Centre for Advanced Studies in Energy (USPCAS-E) to address some of the outstanding challenges faced by the energy sector in Pakistan. Strategic goals behind USPCAS-E are to evolve into a Centre of Excellence in applied research catering to the energy sector and economy of Pakistan with the aim to establish efficient governance structures, sustainability, value-added curriculum, and capacity building, promote applied research to serve public/private sector and NUST-US students/faculty exchange programmes. The core mission of USPCAS-E is to efficiently address and implement the E3 criteria (Energy, Environment, and Economy) for sustainable societal development.

Solar Panels Installed in NUST

NUST is focusing on diversifying its energy sources and aims to make all of its campuses carbon neutral in the following years. So far, solar collectors of 500 KW have been installed at two schools of NUST, which are connected to the grid. Furthermore, a solar-powered desalination plant and street lights are also functional in various campuses across NUST.

Retrofitting of Brick Kilns to Improve Energy Efficiency and Environmental Impact

This project aims at indigenously building a retrofitted Zig-Zag design based brick kiln in Pakistan to serve as a model for brick kiln owners in Pakistan. The project had been initiated at the request of Brick Kiln Owners Association (BKOA) Pakistan. BKOA delegation including Association President and other members visited USPCASE NUST and requested to provide technical support and guidance in implementing Zig-Zag based retrofitting of brick kilns in Pakistan. Earlier, National Energy Efficiency and Conservation Authority (NEECA) and Pakistan Environmental Protection Agency (Pak EPA) in collaboration with International Centre for Integrated Mountain Development (ICIMOD) Nepal had recently arranged

a series of workshops to educate Pakistani brick kiln owners about benefits of Zig-Zag brick kilns. As a result, one of the brick kiln owners in Lahore established first Zig-Zag design based retrofitted brick kiln. This brick kiln is performing significantly better than conventional brick kilns therefore, this cost effective retrofitting is expected to replace the conventional brick kiln design for energy efficiency. NUST USPCASE served as a platform for the training of the brick kiln industry stakeholders.

IoT Based Industrial Load Monitoring and Management System

The proposed project focuses on indigenization of an industrial energy monitoring system for large, medium and small scale industries/organizations, housing societies, large civic authorities and smaller organization like universities, hospitals etc. The prototype developed will be an innovative and automated scalable IoT based Industrial Load Management system to monitor the energy consumption in real time.

The system will be deployed at smart energy meters at generation, loads, and distribution and transmission nodes. These meters will collect power profile data 24/7, form a robust communication network using Microchip Wireless (MiWi)/Long Range (LoRa) network and finally terminate at Gateway. The data will be sent to cloud server over GPRS/Wi-Fi/LAN (whichever interface is available) to store, process, analyze and for decision-making. Owing to the fast development in deep and machine learning techniques, data analytics algorithms will be developed and applied on acquired data, to extract energy consumption pattern, energy predictive analysis, anomaly detection, power quality calculation, accurate metering and calculation of loads efficiencies. Such load management systems are effective in identifying load patterns to optimize energy usage and eventually save a lot of energy by cutting off leakages.

Development of nanocomposites for high temperature thermochemical energy storage

Effective energy storage is one of the challenges our researchers are continuously trying to resolve through research. Our researchers have investigated and discovered composite materials as a promising medium for thermal energy storage. Thermochemical energy storage, based on reversible solid-gas reaction, offer efficiency, seasonal storage, high storage density and cost-effective methods for solar power plants. Concentrated solar power plants (CSP) are potential source of power generation for future technology. The intermittence of power during night time makes this technology less viable. In order to improve the efficiency of CSP plant, it is necessary to incorporate a storage system that can provide the required energy overnight.

Calcium hydroxide is a promising candidate as

storage medium due to its high storage density and cheap cost. However, calcium hydroxide suffers from low thermal conductivity, poor flows and subdued cyclic stability. In order to combat these problems, our researchers have added several materials composites to improve the energy storage capacity.

National Conference on Energy Trends

The U.S.Pakistan Centre for Advanced Studies in Energy (USPCAS-E) at NUST hosted "National Conference on Energy Trends" in Oct 2018, to bring together national energy professionals associated with renowned policy think tanks, academia and government sectors, and industrial organizations to exchange information and ideas on energy generation, transmission and storage related developments. The conference was attended by experts from academia, industry and corporate sector.